

1                   **CONNECTOR OF HAND TOOL**

2                   **BACKGROUND OF THE INVENTION**

3                   **1. Field of the Invention**

4                  The present invention relates to a connector, and more particularly to  
5                  a connector for a hand tool, such as the socket, the screwdriver head or the like.

6                   **2. Description of the Related Art**

7                  A conventional connector comprises an operation seat having a first  
8                  end formed with a receiving hole for receiving a spring and a positioning ball,  
9                  and an elongated rod extended through a second end of the operation seat. In  
10                 assembly, when a hand tool, such as a socket or screwdriver head, is mounted  
11                 on the operation seat of the conventional connector, the inner wall of the socket  
12                 is locked by the protruding positioning ball, thereby positioning the socket on  
13                 the operation seat of the conventional connector. In operation, when the socket  
14                 is mounted on a workpiece, such as a bolt or nut, the elongated rod can be  
15                 rotated to produce a larger torque so as to screw or unscrew the bolt.

16                 However, the inner wall of the socket is locked by the protruding  
17                 positioning ball, so that the socket is fixed on the operation seat closely. Thus,  
18                 the socket cannot be detached from the operation seat easily and conveniently,  
19                 thereby causing inconvenience to the user in removing the socket from the  
20                 operation seat of the conventional connector.

21                   **SUMMARY OF THE INVENTION**

1           The present invention is to mitigate and/or obviate the disadvantage  
2 of the conventional connector.

3           The primary objective of the present invention is to provide a  
4 connector, wherein the main body is movable relative to the operation seat of  
5 the operation member to retract the positioning ball into the receiving cavity of  
6 the movable rod, so that the socket can be mounted on and detached from the  
7 connector easily and conveniently, thereby saving the manual work.

8           Another objective of the present invention is to provide a connector,  
9 wherein the operation member is moved relative to the main body to move the  
10 movable rod to align the receiving cavity with the positioning hole, so that the  
11 positioning ball is received in the receiving cavity and is entirely hidden in the  
12 positioning hole, thereby releasing the socket from the receiving portion of the  
13 main body.

14           A further objective of the present invention is to provide a connector,  
15 wherein after the force applied on the operation member is removed, the  
16 operation seat of the operation member is pushed and returned to the original  
17 position by the restoring force of the cone-shaped spring of the connector seat,  
18 while the movable rod of the connector seat is pushed and returned to the  
19 original position by the restoring force of the restoring spring of the connector  
20 seat.

21           A further objective of the present invention is to provide a connector,  
22 wherein the connector seat is an independent structure, so that the connector

1 seat can be used to combine with the operation seat of any kinds and types,  
2 thereby enhancing the versatility of the connector.

3 In accordance with the present invention, there is provided a  
4 connector, comprising an operation member, and a connector seat, wherein:

5 the operation member includes an operation seat;

6 the connector seat is combined with the operation member and  
7 includes:

8 a main body movably mounted on the operation seat of the operation  
9 member;

10 a movable rod slidably mounted in the main body and has a first end  
11 rested on an end face of the operation seat of the operation member and a  
12 second end having a periphery formed with a receiving cavity;

13 a positioning ball movably mounted on the main body and aligned  
14 with the receiving cavity of the movable rod; and

15 at least one spring mounted on the movable rod and urged between  
16 the main body and the movable rod.

17 Further benefits and advantages of the present invention will become  
18 apparent after a careful reading of the detailed description with appropriate  
19 reference to the accompanying drawings.

20 **BRIEF DESCRIPTION OF THE DRAWINGS**

21 Fig. 1 is an exploded perspective view of a connector in accordance  
22 with a first embodiment of the present invention;

1           Fig. 2 is a side plan cross-sectional assembly view of the connector  
2       as shown in Fig. 1;

3           Fig. 3 is a schematic operational view of the connector as shown in  
4       Fig. 2 in use;

5           Fig. 4 is a side plan cross-sectional assembly view of a connector in  
6       accordance with a second embodiment of the present invention;

7           Fig. 5 is a side plan cross-sectional assembly view of a connector in  
8       accordance with a third embodiment of the present invention;

9           Fig. 6 is a plan view of the connector as shown in Fig. 5;

10          Fig. 7 is a side plan cross-sectional assembly view of a connector in  
11       accordance with a fourth embodiment of the present invention;

12          Fig. 8 is a plan view of the connector as shown in Fig. 7; and

13          Fig. 9 is a side plan cross-sectional assembly view of a connector in  
14       accordance with a fifth embodiment of the present invention.

15          **DETAILED DESCRIPTION OF THE INVENTION**

16          Referring to the drawings and initially to Figs. 1 and 2, a connector in  
17       accordance with the first embodiment of the present invention comprises an  
18       operation member 10, and a connector seat 20.

19          The operation member 10 includes an operation seat 12 having a first  
20       end formed with a receiving hole 15 for receiving a spring 18 and a retaining  
21       ball 16, and an elongated rod 14 extended through a second end of the  
22       operation seat 12.

1           The connector seat 20 is combined with the operation member 10  
2   and includes a main body 21, a movable rod 22, a restoring spring 23, and a  
3   cone-shaped spring 24.

4           The main body 21 of the connector seat 20 is movably mounted on  
5   the operation seat 12 of the operation member 10 and has a first end formed  
6   with a cylindrical mounting portion 211 and a second end formed with a square  
7   receiving portion 212. The mounting portion 211 of the main body 21 of the  
8   connector seat 20 has an inner wall formed with an annular slide groove 213,  
9   and the retaining ball 16 on the operation seat 12 of the operation member 10 is  
10   slidably mounted in the slide groove 213 of the mounting portion 211 of the  
11   main body 21. The inner wall of the mounting portion 211 of the main body 21  
12   of the connector seat 20 is formed with a catch edge 214 located between the  
13   slide groove 213 and receiving portion 212. The receiving portion 212 of the  
14   main body 21 of the connector seat 20 has an inner wall formed with a stop  
15   edge 215. The receiving portion 212 of the main body 21 of the connector seat  
16   20 has a periphery formed with a positioning hole 216 communicating with an  
17   inside of the receiving portion 212 for receiving a positioning ball 25.

18           The movable rod 22 of the connector seat 20 is slidably mounted in  
19   the main body 21 and has a first end formed with an enlarged head 222 rested  
20   on an end face of the first end of the operation seat 12 of the operation member  
21   10 and a second end having a periphery formed with a receiving cavity 221  
22   aligning with the positioning hole 216 of the receiving portion 212 of the main

1 body 21. The receiving cavity 221 of the movable rod 22 has a side formed  
2 with an inclined face 223 rested on the positioning ball 25. Thus, when the  
3 positioning ball 25 is received in the positioning hole 216 of the receiving  
4 portion 212 of the main body 21, the inclined face 223 of the receiving cavity  
5 221 of the movable rod 22 is rested on the positioning ball 25, to push the  
6 positioning ball 25 outward from the positioning hole 216 of the receiving  
7 portion 212 of the main body 21.

8           The restoring spring 23 of the connector seat 20 is mounted on the  
9 movable rod 22 and has a first end rested on the enlarged head 222 of the  
10 movable rod 22 and a second end rested on the stop edge 215 of the receiving  
11 portion 212 of the main body 21.

12           The cone-shaped spring 24 of the connector seat 20 is mounted on  
13 the movable rod 22 and has a first end rested on the end face of the first end of  
14 the operation seat 12 of the operation member 10 and a second end rested on  
15 the catch edge 214 of the mounting portion 211 of the main body 21.

16           In use, when a hand tool, such as a socket or screwdriver head (not  
17 shown) is mounted on the receiving portion 212 of the main body 21, the inner  
18 wall of the socket is locked by the protruding positioning ball 25 as shown in  
19 Fig. 2, thereby positioning the socket on the receiving portion 212 of the main  
20 body 21.

21           Referring to Fig. 3 with reference to Figs. 1 and 2, the user exerts a  
22 force to press the operation seat 12 of the operation member 10, so that the

1 operation seat 12 of the operation member 10 is moved toward the main body  
2 21 of the connector seat 20 to press the movable rod 22 of the connector seat 20  
3 to move in the main body 21. Thus, the movable rod 22 of the connector seat  
4 20 is moved in the main body 21 from the position as shown in Fig. 2 to the  
5 position as shown in Fig. 3 where the receiving cavity 221 of the movable rod  
6 22 aligns with the positioning hole 216 of the receiving portion 212 of the main  
7 body 21, so that the positioning ball 25 is received in the receiving cavity 221  
8 of the movable rod 22 and is entirely hidden in the positioning hole 216 of the  
9 receiving portion 212 of the main body 21, thereby releasing the socket from  
10 the receiving portion 212 of the main body 21. In addition, the second end of  
11 the movable rod 22 is protruded outward from the receiving portion 212 of the  
12 main body 21 as shown in Fig. 3, so that the released socket can be detached  
13 from the receiving portion 212 of the main body 21 easily and conveniently.  
14 Thus, the socket can be mounted on and detached from the receiving portion  
15 212 of the main body 21 easily and conveniently, thereby saving the manual  
16 work.

17 After the force applied on the operation seat 12 of the operation  
18 member 10 is removed, the operation seat 12 of the operation member 10 is  
19 pushed and returned to the original position by the restoring force of the  
20 cone-shaped spring 24 of the connector seat 20, while the movable rod 22 of  
21 the connector seat 20 is pushed and returned to the original position by the  
22 restoring force of the restoring spring 23 of the connector seat 20.

1           Accordingly, the connector seat 20 is an independent structure, so  
2       that the connector seat 20 can be used to combine with the operation seat 12 of  
3       any kinds and types, thereby enhancing the versatility of the connector.

4           Referring to Fig. 4, the connector in accordance with the second  
5       embodiment of the present invention is shown, wherein the operation seat 12A  
6       is formed with an elongated guide slot 121A, and the connector further  
7       comprises a fixing pin 122A extended through the mounting portion 211A of  
8       the main body 21A and the guide slot 121A of the operation seat 12A, so that  
9       the operation seat 12A is movable relative to the main body 21A.

10          Referring to Figs. 5 and 6, the connector in accordance with the third  
11       embodiment of the present invention is shown, wherein the mounting portion  
12       211B of the main body 21B has a wall formed with an elongated guide slot 32B  
13       to receive and guide the retaining ball 16B of the operation seat 12B, so that the  
14       operation seat 12B is movable relative to the main body 21B.

15          Referring to Figs. 7 and 8, the connector in accordance with the  
16       fourth embodiment of the present invention is shown, wherein the mounting  
17       portion 211C of the main body 21C is formed with an oblong slot 34C, and the  
18       operation seat 12C is provided with a retaining pin 36C slidably mounted in  
19       the oblong slot 34C of the mounting portion 211C of the main body 21C, so  
20       that the operation seat 12C is movable relative to the main body 21C.

21          Referring to Fig. 9, the connector in accordance with the fifth  
22       embodiment of the present invention is shown, wherein the connector further

1 comprises an extension 38D mounted between the operation seat 12D and the  
2 main body 21D. In practice, the extension 38D is movable relative to the main  
3 body 21D, so that the movable rod 22 mounted in the main body 21D is pushed  
4 to move the receiving cavity 221D to align with the positioning ball 25D.

5           Although the invention has been explained in relation to its preferred  
6 embodiment(s) as mentioned above, it is to be understood that many other  
7 possible modifications and variations can be made without departing from the  
8 scope of the present invention. It is, therefore, contemplated that the appended  
9 claim or claims will cover such modifications and variations that fall within the  
10 true scope of the invention.